

PATENTS  
107044-0007**IN THE CLAIMS:**

1. (Currently Amended) A membrane electrode assembly for use in a direct oxidation fuel cell comprising:

a barrier layer of material that is substantially protonically non-conductive and which is substantially impermeable to water and carbonaceous fuel;

first and second protonically conductive membranes disposed, respectively, on opposite surfaces of said barrier layer;

selected sites comprising openings providing passages through [[in]] said barrier layer enabling protonically conductive contact through said passages between said first and second membranes;

first and second catalysts disposed, respectively, on the surfaces of said membranes which are not in contact with said barrier layer; and

first and second diffusion material layers disposed, respectively, on the surfaces of said catalysts which are not in contact with said membranes.

1 2. (Currently Amended) The assembly as in claim 1 wherein said barrier layer com-  
2 prises a microporous material.

1 3. (Currently Amended) The assembly as in claim 1 wherein said barrier layer com-  
2 prises a polyester microfilm with microperforations.

1 4. (Currently Amended) The assembly as in claim 1 wherein said barrier layer com-  
2 prises a polyimide film with microperforations.

1 5. (Original) The assembly as in claim 1 wherein said assembly is used in a di-  
2 rect methanol fuel cell.

PATENTS  
107044-0007

1 6. (Currently Amended) A layered membrane for use in a direct oxidation fuel cell  
2 comprising:

3 a barrier layer of material that is substantially protonically non-conductive and  
4 which is substantially impermeable to water and carbonaceous fuel; and  
5 first and second protonically conductive membranes disposed, respectively, on  
6 opposite surfaces of said barrier layer; and  
7 selected sites comprising openings providing passages through ~~[[in]]~~ said barrier  
8 layer enabling protonically conductive contact through said passages between said first  
9 and second membranes.

1 7. (Currently Amended) The membrane as in claim 6 wherein said barrier layer  
2 comprises a microporous material.

1 8. (Currently Amended) The membrane as in claim 6 wherein said barrier layer  
2 comprises a polyester microfilm with microperforations.

1 9. (Currently Amended) The membrane as in claim 6 wherein said barrier layer  
2 comprises a polyimide film with microperforations.

1 10. (Original) The membrane as in claim 6 wherein said membrane is used in a direct  
2 methanol fuel cell.

1 11. (Currently Amended) A method of constructing a layered membrane for use in a  
2 direct oxidation fuel cell comprising the steps of:

3 providing a layer of material that is substantially protonically non-conductive and  
4 which is substantially impermeable to water and carbonaceous fuel; and  
5 providing, on opposite sides of said layer, protonically conductive membranes;  
6 and providing sites that include passages for protons to pass through ~~[[in]]~~ said  
7 layer which allow protonically conductive contact between said protonically conductive  
8 membrane.

PATENTS  
107044-0007

1 12. (Original) The method as in claim 11 wherein said layer comprises a microporous  
2 material.

1 13. (Original) The method as in claim 11 wherein said layer comprises a polyester  
2 microfilm with microperforations.

1 14. (Original) The method as in claim 11 wherein said layer comprises a polyimide  
2 film with microperforations.

1 15. (Currently Amended) A method of constructing a membrane electrode assembly  
2 for use in a direct oxidation fuel cell comprising the steps of:  
3 providing a barrier layer of material which is substantially impermeable to water  
4 and carbonaceous fuel and which [[permeable]] is substantially impermeable to protons;  
5 providing, on opposite sides of said barrier layer, first and second protonically  
6 conductive membranes;  
7 providing sites in said barrier layer which allow protonically conductive contact  
8 between said protonically conductive membrane; and  
9 providing, on the surfaces of said membranes which are not in contact with said  
10 layer, first and second catalyst layers; and  
11 providing, on the surfaces of said first and second catalyst layers which are not in  
12 contact with said membranes, first and second distribution layers.

1 16. (Original) The method as in claim 15 wherein said barrier layer comprises a mi-  
2 croporous material.

1 17. (Original) The method as in claim 15 wherein said barrier layer comprises a poly-  
2 ester microfilm with microperforations.

PATENTS  
107044-0007

1 18. (Original) The method as in claim 15 wherein said barrier layer comprises a  
2 polyimide film with microperforations.

1 19. (Currently Amended) A direction oxidation fuel cell comprising:  
2 an anode;  
3 a cathode;  
4 a membrane electrode assembly, said assembly including a barrier layer of mate-  
5 rial that is substantially protonically non-conductive and which is substantially imperme-  
6 able to water and fuel, first and second protonically conductive membranes disposed, re-  
7 spectively, on opposite surfaces of said barrier layer, said barrier layer having sites in said  
8 barrier layer that allow protonically conductive contact between said membranes, first  
9 and second catalysts disposed, respectively, on the surfaces of said membranes which are  
10 not in contact with said layer, and first and second diffusion material layers disposed, re-  
11 spectively, on the surfaces of said catalysts which are not in contact with said mem-  
12 branes; and  
13 a housing in which said anode, cathode and assembly are disposed.

1 20. (Currently Amended) The fuel cell as in claim 19 wherein said barrier layer com-  
2 prises a microporous material.

1 21. (Currently Amended) The fuel cell as in claim 19 wherein said barrier layer com-  
2 prises a polyester microfilm with microperforations.

1 22. (Currently Amended) The fuel cell as in claim 19 wherein said barrier layer com-  
2 prises a polyimide film with microperforations.

1 23. (Original) The fuel cell as in claim 19 wherein said fuel cell is a direct methanol  
2 fuel cell.